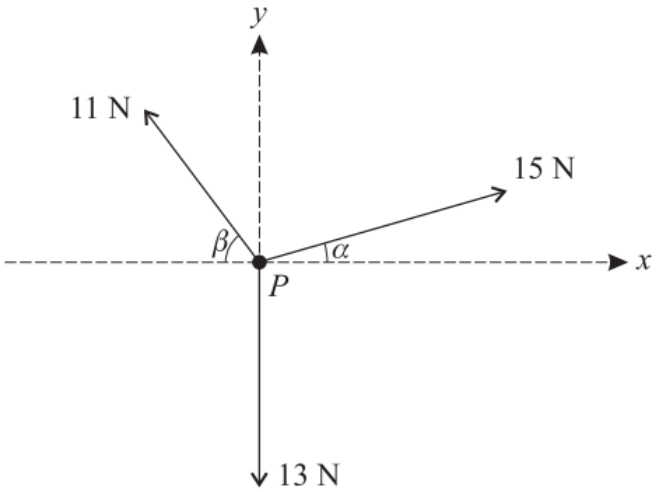
Resolving Non-Perpendicular Forces at a Point (From OCR 4728)

Q1, (Jan 2007, Q2)



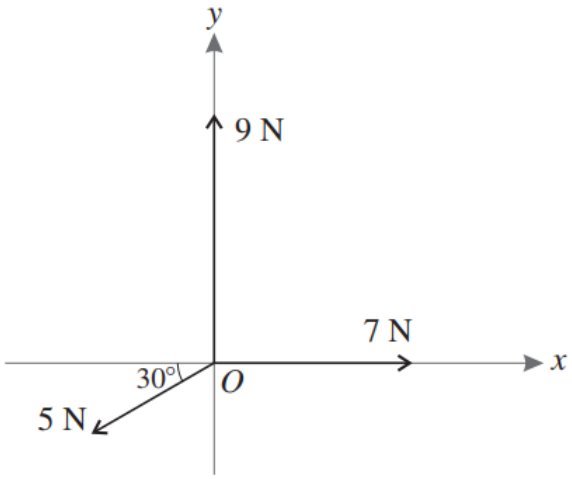
Three horizontal forces of magnitudes 15 N, 11 N and 13 N act on a particle P in the directions shown in the diagram. The angles α and β are such that $\sin\alpha = 0.28$, $\cos\alpha = 0.96$, $\sin\beta = 0.8$ and $\cos\beta = 0.6$.

(i) Show that the component, in the y-direction, of the resultant of the three forces is zero. [4]

(ii) Find the magnitude of the resultant of the three forces. [3]

(iii) State the direction of the resultant of the three forces. [1]

Q2, (Jan 2009, Q3)

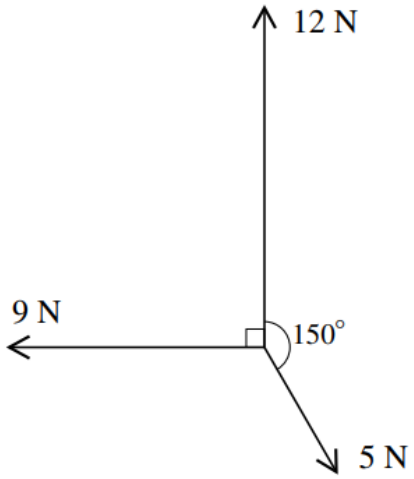


Three horizontal forces act at the point O. One force has magnitude 7 N and acts along the positive x-axis. The second force has magnitude 9 N and acts along the positive y-axis. The third force has magnitude 5 N and acts at an angle of 30° below the negative x-axis (see diagram).

(i) Find the magnitudes of the components of the 5 N force along the two axes. **[2]**

(ii) Calculate the magnitude of the resultant of the three forces. Calculate also the angle the resultant makes with the positive x-axis. **[6]**

Q3, (Jun 2010, Q3)



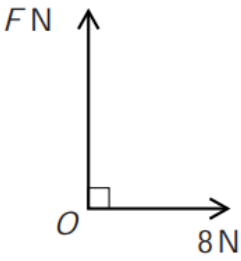
Three horizontal forces of magnitudes 12 N, 5 N, and 9 N act along bearings 000°, 150° and 270° respectively (see diagram).

(i) Show that the component of the resultant of the three forces along bearing 270° has magnitude 6.5 N. **[2]**

(ii) Find the component of the resultant of the three forces along bearing 000°. **[2]**

(iii) Hence find the magnitude and bearing of the resultant of the three forces. **[5]**

Q4, (Jun 2012, Q1)



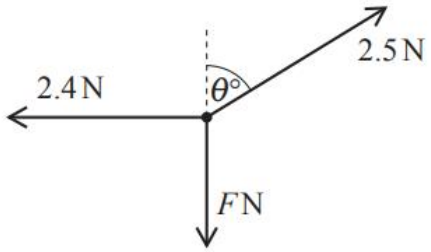
Two perpendicular forces of magnitudes F N and 8 N act at a point O (see diagram). Their resultant has magnitude 17 N.

(i) Calculate F and find the angle which the resultant makes with the 8 N force. **[4]**

A third force of magnitude E N, acting in the same plane as the two original forces, is now applied at the point O. The three forces of magnitudes E N, F N and 8 N are in equilibrium.

(ii) State the value of E and the angle between the directions of the E N and 8 N forces. **[2]**

Q5, (Jun 2014, Q2)



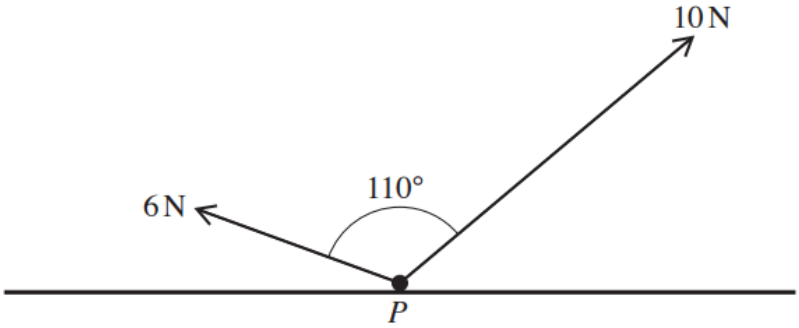
A particle rests on a smooth horizontal surface. Three horizontal forces of magnitudes 2.5 N, F N and 2.4 N act on the particle on bearings $\theta°$, 180° and 270° respectively (see diagram). The particle is in equilibrium.

(i) Find θ and F. **[4]**

The 2.4 N force suddenly ceases to act on the particle, which has mass 0.2 kg.

(ii) Find the magnitude and direction of the acceleration of the particle. **[3]**

Q6, (Jun 2015, Q4)



Two forces of magnitudes 6 N and 10 N separated by an angle of 110° act on a particle P, which rests on a horizontal surface (see diagram).

(i) Find the magnitude of the resultant of the 6 N and 10 N forces, and the angle between the resultant and the 10 N force. **[6]**

The two forces act in the same vertical plane. The particle P has weight 20 N and rests in equilibrium on the surface. Given that the surface is smooth, find

(ii) the magnitude of the force exerted on P by the surface, **[1]**

(iii) the angle between the surface and the 10 N force. **[2]**
